

5

CLAIMS

What Is Claimed Is:

- 5b
94
- 10 1. A variable reflectance vehicle mirror which can be controlled to adjust reflectivity, comprising:
- a super twisted nematic (STN) liquid crystal cell having a front side and a rear side;
- a first polarization filter positioned on the front side of said STN liquid crystal cell;
- 15 a second polarization filter positioned on the rear side of said STN liquid crystal cell;
- a reflective layer positioned adjacent to said second polarization filter; and
- a control circuit connected to said STN liquid crystal cell for controlling the birefringence of the STN liquid crystal cell to adjust the degree of reflection of the
- 20 mirror.
2. The variable reflectance vehicle mirror of claim 1, wherein said STN liquid crystal cell includes a layer of super twisted nematic (STN) liquid crystal material positioned between a pair of transparent electrodes.
- 25 3. The variable reflectance vehicle mirror of claim 2, wherein said STN liquid crystal material possesses a twist angle between approximately 180° and approximately 270° between the pair of electrodes.
- 30 4. The variable reflectance vehicle mirror of claim 3, wherein said STN liquid crystal material possesses a twist angle of approximately 210° .
5. The variable reflectance vehicle mirror of claim 2, wherein said STN liquid crystal material further includes a cholesteric material.

09821657.073001

5

6. The variable reflectance vehicle mirror of claim 3, wherein the surfaces of the pair of electrodes facing one another each include an alignment layer positioned thereon for orienting the STN liquid crystal material to its desired twist angle.

10

7. The variable reflectance vehicle mirror of claim 6, wherein the alignment layers comprise a polymer material which is surface treated to provide the desired orientation of the STN liquid crystal material.

15

8. The variable reflectance vehicle mirror of claim 1, wherein said STN liquid crystal cell further comprises front and rear transparent plates respectively positioned adjacent to outer surfaces of said electrodes.

20

9. The variable reflectance vehicle mirror of claim 8, wherein said front and rear transparent plates are adhered together around their periphery to seal said STN liquid crystal cell together.

25

10. The variable reflectance vehicle mirror of claim 9, further comprising spacers being positioned in said STN liquid crystal material between the front and rear transparent plates in order to provide a constant thickness of the space between the front and rear transparent plates.

30

11. The variable reflectance vehicle mirror of claim 1, wherein the first and second polarization filters are crossed polarizers.

12. The variable reflectance vehicle mirror of claim 3, wherein the said control circuit is connected to said pair of transparent electrodes to apply a bias voltage across said electrodes.

35

13. The variable reflectance vehicle mirror of claim 12, wherein the bias voltage applied across said electrodes by said control circuit may be varied to vary the

ay
Cont'd

09821667.073001
FO0E20 299T2860

Q4 Cont'd

10

15

20

25

30

SECRET

20. The variable reflectance vehicle mirror of claim 19, wherein the bias voltage applied to said STN liquid crystal cell may be adjusted to provide a desired reflectivity of light by the mirror in accordance with the detected intensity of light.

21. The variable reflectance vehicle mirror of claim 1, wherein said mirror is formed to include a rimless outer periphery.

22. The variable reflectance vehicle mirror of claim 1, wherein rimless outer periphery of said mirror is accomplished by trimming the stacked configuration of the STN liquid crystal cell, first and second polarization filters, and reflective layer after the stacked configuration is formed.

23. The variable reflectance vehicle mirror of claim 1, wherein the stacked configuration of the STN liquid crystal cell, first and second polarization filters, and reflective layer are trimmed using a water jet to fuse the edges of these layers in the stacked configuration together.

24. The variable reflectance vehicle mirror of claim 1, wherein the mirror can be controlled to adjust the level of reflectivity to a value between approximately 28% and approximately 94%.

25. The variable reflectance vehicle mirror of claim 1, further comprising a first photo sensor for detecting an intensity of a glare-causing light impinging upon said photo sensor and providing a signal indicative of the intensity of the light detected, said control circuit being connected to said first photo sensor for receiving the signal indicative of the intensity of the light detected and applying a bias voltage to said STN liquid crystal cell accordingly to control the degree of reflectivity of the mirror.

26. The variable reflectance vehicle mirror of claim 25, further comprising a second photo sensor for detecting ambient light levels and providing a signal indicating when the intensity of the ambient light detected is greater than a threshold value, said

09821657.073001

ay
Cont'd

5 control circuit being connected to said second photo sensor for receiving the signal
indicative of the intensity of the ambient light detected being greater than the threshold
value so that said control circuit disables the effect of the first photo sensor in controlling
the degree of reflectivity of the mirror when the ambient light detected being greater than
the threshold value.

10 27. The variable reflectance vehicle mirror of claim 26, wherein said first and
second photo sensors are directly attached to a housing for the mirror.

15 28. The variable reflectance vehicle mirror of claim 1, wherein said mirror is
an independently controlled interior rearview mirror for a vehicle.

29. The variable reflectance vehicle mirror of claim 1, wherein said mirror is
an independently controlled exterior mirror for a vehicle.

20 30. The variable reflectance vehicle mirror of claim 1, further comprising:
an anterior transparent panel adjacent to said first polarization filter; and
a posterior transparent panel adjacent to said reflective layer adjacent to
said second polarization filter.

25 31. The variable reflectance vehicle mirror of claim 30, wherein said anterior
transparent panel and said posterior transparent panel are comprised of glass.

32. The variable reflectance vehicle mirror of claim 30, wherein said anterior
transparent panel and said posterior transparent panel are comprised of synthetic plastic.

30 33. The variable reflectance vehicle mirror of claim 30, wherein said anterior
transparent panel includes at least one optically enhancing coating.

34. The variable reflectance vehicle mirror of claim 30, wherein said anterior
transparent panel includes an abrasion resistant coating formed thereon.

94
Cont'd

100E20" 99T2860

090216Z 073001

5

10

15

20

25

30

5 a second polarization filter positioned on a rear side of said STN liquid
crystal cell; and
a reflective layer positioned adjacent to said second polarization filter.

43. The variable reflectance vehicle mirror of claim 42, wherein said
10 reflective layer comprises an enhanced aluminum material.

44. A variable reflectance vehicle mirror which can be controlled to adjust
reflectivity, comprising:
a super twisted nematic (STN) liquid crystal cell having a front side and a
15 rear side;
a first polarization filter positioned on the front side of said STN liquid
crystal cell;
a second polarization filter positioned on the rear side of said STN liquid
crystal cell; and
20 a reflective layer positioned adjacent to said second polarization filter;
wherein the variable reflectance vehicle mirror is formed to have a rimless
outer periphery.

45. The variable reflectance vehicle mirror of claim 44, wherein the rimless
25 outer periphery of said mirror is achieved by trimming the stacked configuration of the
STN liquid crystal cell, first and second polarization filters, and reflective layer after the
stacked configuration is formed.

46. The variable reflectance vehicle mirror of claim 45, wherein the outer
30 periphery of said mirror is trimmed by a water jet procedure which fuses an outer
periphery of the various layers of said mirror together to provide a weather-resistant seal
around the outer periphery of said mirror.

058221667.073001

at Cont. 1

[illegible]

a light detector for detecting an intensity of light impinging upon the variable reflectance mirror; and

48. The control device of claim 47, wherein said control circuit controls the birefringence of the STN liquid crystal cell by controlling a bias voltage applied across the STN liquid crystal cell.

50. The control device of claim 49, wherein said STN liquid crystal material possesses a twist angle between approximately 180° and approximately 270° in the STN liquid crystal cell.

52. The control device of claim 47, wherein said control circuit may control the reflectance of the variable reflectance mirror over a continuous range by varying the bias voltage applied across the STN liquid crystal cell.

53. The control device of claim 47, further comprising a voltage regulator capable of receiving a source of power from a vehicle from between approximately 6 - 40

5 volts d.c. and generating a bias voltage to be applied to said STN liquid crystal cell between approximately 2.7 to 5.5. volts d.c.

54. The control device of claim 53, wherein said voltage regulator enables the mirror to be retrofit into all existing vehicles by utilizes an existing power harness in the vehicle which provides approximately 6 - 40 volts d.c.

55. The control device of claim 47, wherein said control circuit is formed as a stacked IC.

15 56. The control device of claim 47, wherein said control circuit includes an oscillator formed within the stacked IC for variably adjusting a driving frequency applied to the STN liquid crystal cell.

57. The control device of claim 47, wherein the bias voltage applied to said
20 STN liquid crystal cell may be adjusted to provide a desired reflectivity of light by the
mirror in accordance with the detected intensity of light.

D E L T A - O - 3 0 0 F

add 57